ITS Field Operational Test Summary

Integrated Corridor Traffic Management

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Introduction

The Integrated Corridor Traffic Management (ICTM) ITS Field Operational Test uses advanced adaptive control technology to improve traffic efficiency. The test partners are implementing ICTM along an eight-mile segment of the I-494 corridor south of the Minneapolis - Saint Paul (Twin Cities), Minnesota, metropolitan area. This segment of the corridor crosses multiple jurisdictions and suffers from high levels of recurrent traffic congestion. Authorities anticipate that the congestion will increase significantly in the near future. The ICTM project, conceived by Minnesota Guidestar, proposes to attain optimum corridor capacity through the application of an adaptive traffic control system that responds rapidly to changing traffic conditions. ICTM integrates freeway management, via ramp meters, with signal optimization on parallel and perpendicular surface arterial streets. The project aims to reduce congestion on the freeway by more effectively using the capacity of the parallel arterial system to accommodate locally generated, short trips.

The test is currently operational and evaluation data collection is underway. Originally scheduled for completion in December 1998, the test has been extended by one year to provide a longer evaluation period. The final evaluation report is expected in December 1999.

Project Description

Minnesota Department of Transportation, the project leader, forged a partnership across several jurisdictions affected by the project corridor. The main objectives of the test are:

- Implement an adaptive traffic control strategy that rapidly responds to anticipated and unanticipated fluctuations in traffic flow due to recurrent congestion, incidents, and special events
- Demonstrate that multiple transportation agencies can work together to improve travel conditions throughout the I-494 corridor
- Integrate available advanced technologies to collect and disseminate corridor information
- Provide comprehensive motorist information services.

The Integrated Corridor Traffic Management system synchronizes the operation and management of signalized intersections and freeway entrance ramps within the corridor. The system uses the Sydney Coordinated Adaptive Traffic System (SCATS), developed in Australia, to control the traffic signals and metered ramps included in the project. This project is the first SCATS-based integration test involving freeway and arterial management systems. It aims to accommodate increasing traffic demand in a heavily congested freeway corridor (I-494) by providing optimized, efficient, responsive, and flexible signal operations during both normal traffic flow and during incidents, emergencies, and special events. Figure 1 depicts the project area consisting of an

eight-mile section of I-494, four parallel east-west arterial streets, and seven perpendicular north-south arterial streets.

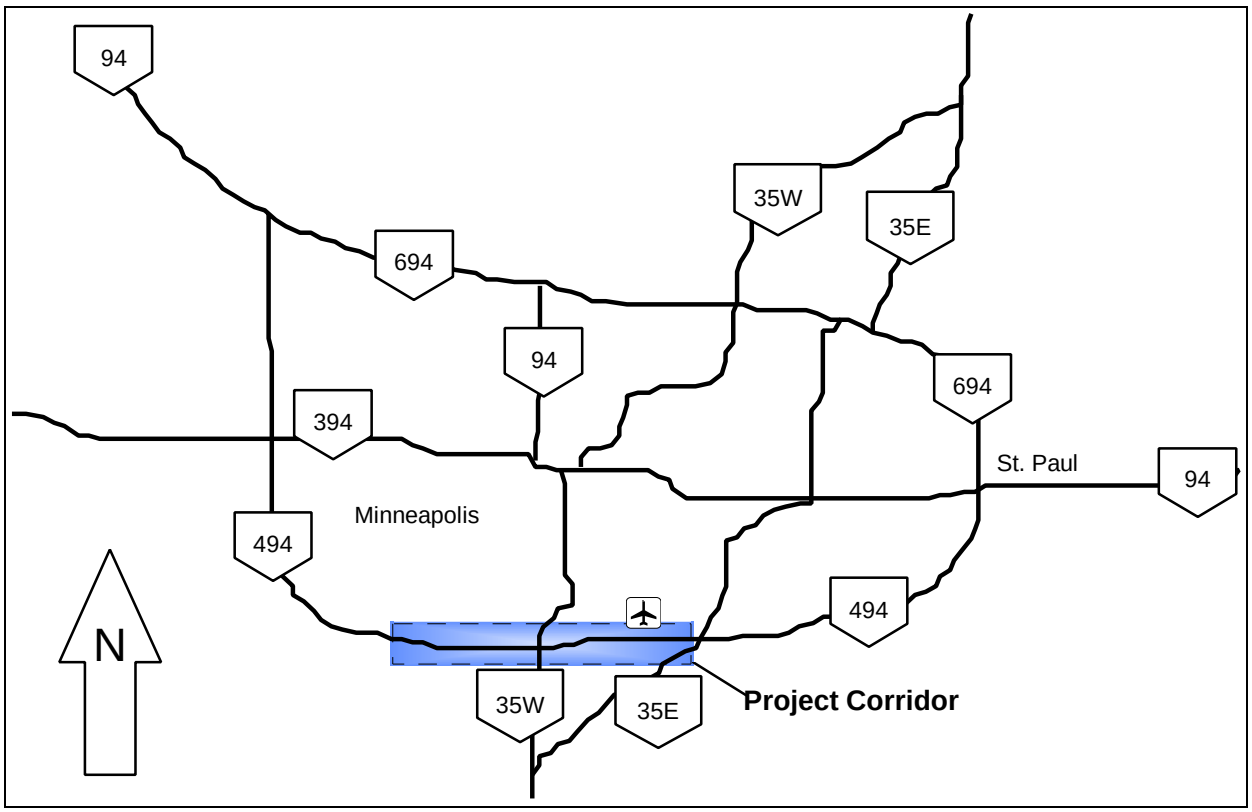

Figure 1: The Project Corridor in Minneapolis-Saint Paul, Minnesota

The project is being implemented in four modules spanning a four to five year period. Table 1 presents the deployment plan showing the components in each module.

Modules 1 & 2, 1995		Module 3, 1996	Module 4, 1998
• System hardware and software • 21 Traffic signals • Video detection at four sites • Develop Communication Plan	• System integration • 27 Ramp meters • Develop Operation Plan • Training	• 41 Traffic signals • 11 CCTV on arterial system • Two on variable message signs on I-494 • Training	• Motorist information devices • Implement Operations Plan • Refine Incident and Special Event Plan

Table 1: Project Deployment Plan and Components

The management system uses state-of-the-art tools to increase the capacity of a transportation corridor. These tools include incident management and adaptive control for arterial traffic signals and ramp metering. These tools are considered core transportation investments that optimize the return on the invested dollars.

Ramp metering minimizes freeway traffic turbulence and disruptions by breaking up platoons on the ramps and releasing vehicles one by one from the metered signal. The tested ramp metering technology provides a greater and more flexible level of control than has been historically feasible. The tested technology uses optimizing algorithms to manage traffic flows. It provides the opportunity to link freeway and arterial management by coordinating ramp meters and traffic signals. The existing, first generation freeway management ramp metering system software serves as a fallback.

The physical meters and the layout of the ramps remain the same as the historical system with most ramps operating as two lanes on the approach to the meter. Metered red times under the new system will range from 0.5 to 22 seconds with the ability to vary the time in 0.1 second increments. The previous system had only six ramp metering rates with a minimum red time of 3 seconds. The system uses queue detectors on the ramps to balance queues and turn the ramp meters off when not needed. The system increases green frequency for ramps with longer queues and reduces it for ramps with shorter queues while maintaining the same rate of overall traffic entry to the freeway section. The new software also allows ramps to be ranked in importance, permitting, for example, freeway to freeway ramps to be given preferential treatment over entrance ramps from surface streets.

The test evaluation will use collected traffic data, documented project information, and interviews with system managers and operators. The evaluation will also rely on surveys and focus groups of motorists, business people, and residents. The evaluation focuses on corridor capacity utilization, corridor operating conditions, adaptive control benefits, corridor safety, project and system deployment cost, value to agencies, and institutional and legal issues.

Test Status

The test and evaluation activities associated with Modules 1, 2, and 3 are complete. Test personnel have installed all field devices and equipment except for that equipment that supports the incident management component. The installation of the remaining equipment and devices will be completed by the summer of 1998. Data collection activities for module 4 are scheduled for April and May 1999.

The evaluation results associated with adaptive ramp metering have been very positive. The system operators perceive adaptive ramp metering as an effective tool to implement metering strategies for recurrent traffic congestion. This conclusion is significant since the operators' expectations of adaptive control effectiveness were already high because of a historically well managed ramp metering system.

Test Partners

City of Bloomington

City of Edina

City of Richfield

Hennepin County

Federal Highway Administration

Minnesota Department of Transportation

TransCore

References

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